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| **Lesson Title:** Gallery Tour of Cedar Glades |
| **Subject area / course / grade level:** Life Science/Middle School |
| **Introduction:** Cedar glades are an endangered ecosystem found primarily in middle Tennessee and a few other localities in the Southeastern United States. Redcedar (*Juniperus virginiana*) trees surround open limestone rocky clearings (glade). Historically cedar glades have been viewed as wastelands, yet they support a plant community of highly specialized species. Glades are characterized by very thin soil that may be completely absent in patches. The shallow soil and exposed bedrock creates a harsh water regime that causes water to pool in the winter and parched, desert-like conditions in the summer. In this extreme environment, special adaptations are required for survival. Because the inhospitable conditions prevent many otherwise abundant species from surviving, cedar glades support unique communities of plants and animals. |
| **Lesson Length:**  40 minutes (can be done in 10 minute increments) |
| **Materials:**   * Brown paper bags or boxes to hold gallery tour items * Bagworm – found hanging on redcedar trees, collect these in season * Limestone Rocks – gray rocks very common to Middle Tennessee (gray rock used in driveways, parking lots) * Limestone Rocks with Fossils (fossils in limestone are marine organisms; the rock substrate is actually made up of calcium carbonate from the bodies of marine organisms) * Flower Photographs of Cedar Glade Flowers (without names) – available with the Cedar Glade Activity Guide or also on Center for Cedar Glade website: [www.mtsu.edu/~gladectr](http://www.mtsu.edu/~gladectr) * Animal Photographs – see Cedar Glade Species List on Cedar Glade website * Cedar Pencil * Cedar “Tree Cookies” – cross sections of redcedar branches * Cedar Shavings (available in pet stores for pet bedding material) * Cedar Berries – not true berries in the botanical sense, but fleshy cones (easy to see fleshy scales, like a pine cone, with a hand magnifier); aromatic and used to flavor meats and gin * Cedar Glade Photograph – see Center for Cedar Glade Studies website * *Echinacea* Capsules Bottle – the Tennessee Coneflower (*Echinacea tennesseensis)* is endemic to glades and is protected by law but other coneflowers have been found to have therapeutic properties and extracts are sold in pharmacies in the herbal medication section (also St. John’s Wort is sold as an antidepressant – this is a glade shrub but not sure if this is appropriate for middle school conversation) * Mosses on Rocks – mosses are plants that serve as the first pioneers and inhabitants on the rocks of the glades * Reindeer Lichen – lichen are fungi that have a symbiotic relationship with an algae (fungal body and algae live within); in moist conditions, the lichens are also the first pioneers and inhabitants on the rocks of the glades * *Nostoc* – dry (this is a cyanobacterium commonly called “Witches Butter” looks like black, burnt paper when dry) – see Center for Cedar Glade website for photograph * *Nostoc* – wet (dried *Nostoc* hydrates quickly and turns green in water) * Gallery Tour Sets – make enough for table teams or arrange on tables. Suggested sets are (1) cedar tree cookies; (2) limestone rocks with fossils; (3) redcedar tree branches with fleshy cones, cedar pencil, cedar shavings; (4) images of cedar glade flowers; (5) images of animals that can be found in glades; (6) reindeer lichen; (7) *Nostoc* wet and dry; (8) *Echinacea* capsules Bottle and photograph of Tennessee Coneflower |
| **Lesson Overview:**  Cedar Glade organisms and related items are easily obtained in the Middle Tennessee area (see materials listed above). Making these materials available to students will increase interest in the study of this local ecosystem. Students will travel from station to station or rotate sets of cedar glade items and record each item viewed. They will make predictions about how each item may relate to the study of the Cedar Glade ecosystem**.** This activity can be used as an introduction to cedar glades and also works well as a summative assessment. |
| **Tennessee Standards:** GLE 0507.2.2; 0507.2.3; 0507.5.2; 0607.2.3; 0607.2.4; 0807.5.3; 0807.5.5 |
| **Lesson objective(s):**  TLW describe different types of organisms (bacteria, plant, animal, fossilized marine life) characteristic to cedar glades  TLW distinguish among symbiotic, commensal, and parasitic relationships found in cedar glade organisms  TLW classify organisms as producers, consumers, scavengers, or decomposers  TLW identify biotic and abiotic factors in a cedar glade |
| **ENGAGEMENT**   * The teacher will prepare sets of items as described above. Prior to distribution, the teacher will ask students if they know what a cedar glade is – if students respond, accept all answers. The teacher will instruct each student to journal or note on an index card 3 – 5 questions they have about cedar glades (let groups generate questions and then ask each student to write one question on their own). * The kinds of questions students should ask themselves after the engagement: What is a cedar glade? Where is a cedar glade found? What lives in a cedar glade? Why do I care about a cedar glade? How do I learn more about a cedar glade? |
| **EXPLORATION**   * Teacher will distribute packaged items to student teams. Each team will receive a different set and be instructed (using their senses – sight, sound, smell, touch, but not taste) they will have 5 – 10 minutes to examine items in the set. Students will list items and discuss how they think that item relates to a cedar glade. Do not identify anything for them; circulate among the groups and encourage discussion. * Teacher will ask students to make a written prediction about how each item in the set relates to a cedar glade. Guiding questions: What are the items? Do you think this is a living thing? Is this a plant or animal or neither? What role does this item play in cedar glades? Why do you think that is so? |
| **EXPLANATION**   * Student teams will identify a spokesperson for each item set so all students have a chance to respond. For example, members in each team will have a specific letter. All of the students that are the letter A will share their ideas for the first set of cedar glade items. Then, all the students that are the letter B will share their ideas about the second set of items, etcetera. It is essential students share first; as students share and have questions, teacher will clarify information and facilitate making connections. * Questions the teacher will ask are: Could your team identify any of the items – yes or no? How does this relate to a cedar glade? What ecological role does this organism fill in a cedar glade? How do you know? What features or information do you see that leads you to make this inference? Does this look like something you have seen in another place in the world? What connections can be made with that organism/s and those observed in the item set? |
| **ELABORATION**   * Students will develop a more sophisticated understanding of the concepts as student teams share their initial questions with each other: Which questions have been answered? What questions still remain? * Vocabulary: ecosystem, producer, consumer, scavenger, decomposer, photosynthesis, commensalism, mutualism, parasitism, endemic species |
| **EVALUATION**   * Students demonstrate that they have achieved the lesson objective by writing a story about a hike through the cedar glades describing the sights, sounds, and smells. Not only is this activity a great ‘teaser’ introduction to cedar glades, it also works well as a formative assessment. Students receive individual item sets and describe how items relate to cedar glades. |